

Abstract of the Disclosure

A semiconductor device (10) has a silicon substrate (12) with first and second transistors formed in the substrate. A copper interconnect (20) is coupled between an active region (14) of the first transistor and an active region (16) of the second transistor. A barrier layer (24) is disposed under the copper interconnect. The barrier layer contains titanium, aluminum, nitrogen, and oxygen with of composition ratio given as $Ti_wAl_xN_yO_z$, where $w=1$, $x=1.4\pm0.5$, $y=3.0\pm0.3$, and $z=1.0\pm0.2$. The barrier layer limits migration of copper into the silicon. A silicide region (18) is formed in the active regions of the first and second transistors and makes electrical contact with the copper interconnect. A portion of the barrier layer resides between the copper interconnect and the silicide region. An oxide layer (22) is disposed between the copper interconnect and the substrate. A portion of the barrier layer resides between the copper interconnect and the substrate.